Disney's

COMPUTER FUN

Exciting games and programs - with & without a computer

PURNELL

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Disney's COMPUTER FUN

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Purnell

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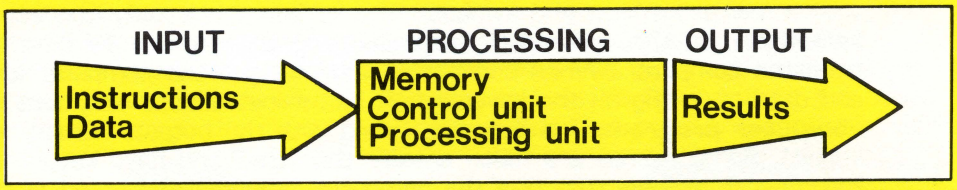
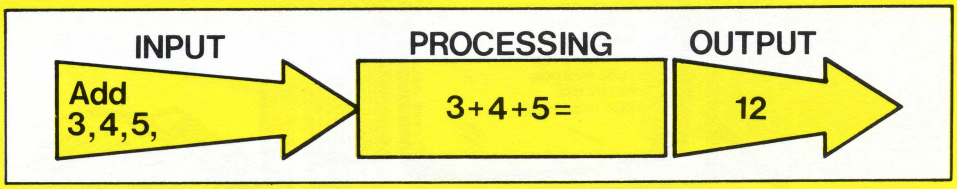
Introduction

Computers

A computer is a machine that processes information. The information given to computers is known as **data**. Data is given to computers along with instructions telling the computer what to do with the data. This is known as the **input**. The computer then obeys the instructions and processes the data using its **memory**, and its **control** and **processing units**. It then produces some results. The results are known as the **output**.



☐ How a computer processes the information depends on the instructions and data. For example, the data may be a list of numbers 3,4,5, and the instructions could be 'add them up'. The input and output would look like this:



The computer looks in its memory to find out how to add up, and then processes the data. Of course, you do not need to use a computer to work out a simple sum like this. But you do need computers to do very complicated calculations at high speed, or to store large amounts of information. Modern computers can also do many other things such as draw pictures and make music.

☐ Computers come in all shapes and sizes, but no matter what their size, they all work in basically the same way. Some computers are as big as rooms, with lots of tapes whizzing round. These are called **mainframe computers**. They are large, powerful machines that can store lots and lots of information. Mainframe computers work very quickly and can do many different jobs at the same time. Other computers are very small. Programmable **pocket calculators** are really small computers.

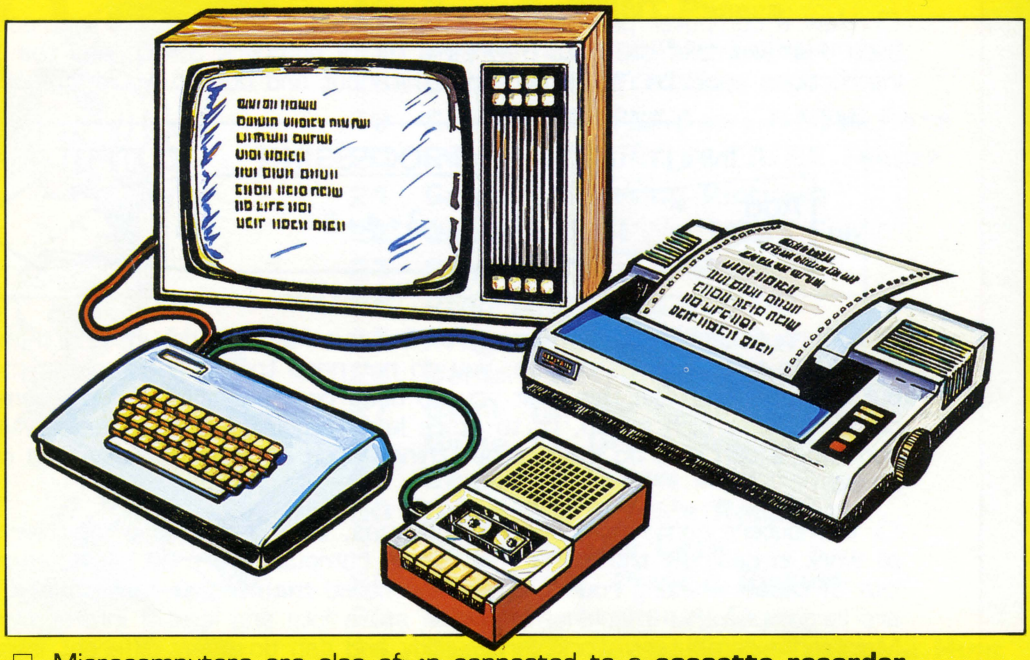
☐ Most computers used today are somewhere in between these two sizes. These are called **minicomputers** and **microcomputers**. Minicomputers are smaller than mainframes and do not work as fast. They often look like large desks. Microcomputers are smaller still and usually fit on the top of a desk or table. On the next few pages we will look more closely at microcomputers because you are most likely to use these at school or home.

Introduction

Microcomputers

Microcomputers are small computers which can be used in the home, in schools, and in offices. You can do complicated sums with them, store information, play games, draw pictures, and on some you can even play music.

☐ Most microcomputers consist of a **keyboard** that looks like a typewriter with a few extra keys and symbols. The keyboard is usually connected to a **television**, so that instead of the usual programmes, the TV gets messages from the computer. When connected, you can give the computer instructions and data by typing on the keyboard. A list of instructions and data is called a **computer program**. The program, along with the output, will appear on the TV screen. Some micros are much smaller than this, and have keyboards with touch-sensitive keys that give the computer instructions instead of typing letters.



☐ Microcomputers are also often connected to a **cassette recorder**. Computer programs can be recorded on cassette tape just like your favourite pop songs. This means that information can be stored and used over and over again. You can use a cassette recorder to save the programs you write yourself, or to play the programs you buy from computer shops.

☐ Another way of saving programs is to use **floppy disks**. To use them, you also need a **disk drive**. Disk drives are much more expensive than cassette recorders, but they can record and play back programs much more quickly.

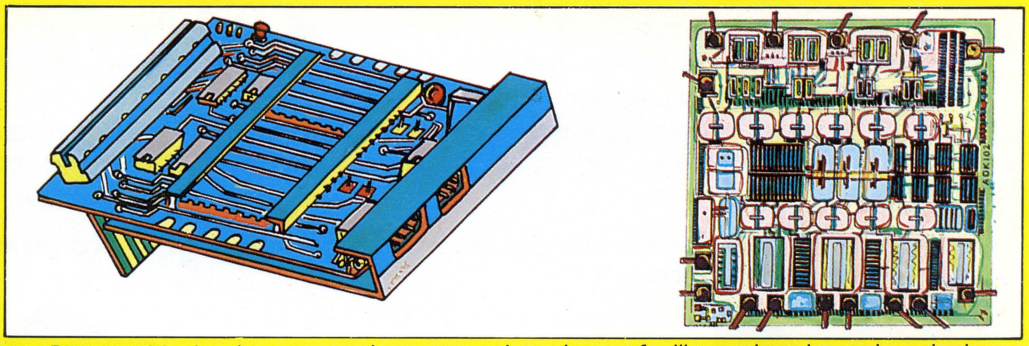
☐ You can also save programs on paper, using a **printer**. A printer can print program listings, data and even pictures.

Introduction

How A Microcomputer Works

The keyboard of a microcomputer is connected to the main part of the computer—the **printed circuit board** or PCB. The PCB is usually found inside the keyboard case. Each time a key is pressed, an electrical signal is sent to the PCB. Each key sends a different signal.

☐ The PCB has lots of metal lines on its surface, and the electrical signals from the keys pass along them. Also on the PCB are other electrical components—such as capacitors and resistors—and the most important part of microcomputers, **silicon chips**. The electrical signals flowing along the metal lines pulse through the chips. It is these pulses that make the computer work.



☐ Silicon chip is the name given to a tiny piece of silicon that has electrical circuits engraved on it. Although a chip is much smaller than a postage stamp, it often has as many as ten different circuits on it. This is why the proper name for a chip is an **integrated circuit**. The pieces of silicon are put in plastic cases, and are connected to the PCB by metal legs.

Most microcomputers have three chips:

Microprocessor chip—this is the control centre of a micro. It is usually called the Central Processing Unit or CPU. The CPU carries out the instructions in your programs and controls the flow of information to the TV screen. It also contains a quartz crystal clock that controls the flow of electrical signals inside the computer.

ROM chip—ROM stands for Read Only Memory. This chip contains circuits that form the programs that tell the computer how to operate. This type of memory is already full when you buy a micro, and you cannot change the information in it.

RAM chip—RAM stands for Random Access Memory. It's in this chip that the computer stores your programs and data. This memory is empty when you buy a micro, ready for you to put things in it.

☐ When a computer is switched off, it remembers everything in the ROM chip, but loses all the information in the RAM chip. This means that if you want to save your programs, you need to use a cassette recorder [or floppy disk].

☐ Most micros have one more thing on their PCBs—a **modulator**. This changes the electrical signals coming out of the chips into signals that the TV can understand. Without a modulator, the TV screen would not display the information you want.

Introduction

Programming A Microcomputer

Computers cannot understand English, so you have to use a special computer language to give them information. Most microcomputers use a language called BASIC*. When you type instructions in BASIC, the computer translates them into electrical pulses that the chips understand.

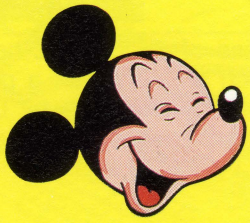
☐ All written languages have rules. In English, you have to start a sentence with a capital letter and end it with a full stop. Computer languages also have rules. At first you may find computer rules hard to understand. This is because they are different from the rules of English, but they are not really difficult, and you can soon learn them off by heart.

☐ The first rule is that you can only use capital letters when programming in BASIC. When you know a few more rules, you will be able to write a program.

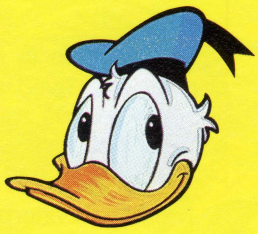
Computer programs

A computer program is a list of numbered instructions which a computer can store in its memory. The computer will carry out the instructions in order when you tell it to.

☐ Here is an example. This program adds together 5 and 3 and prints the answer on the screen.



```
10 REM "ADD"
20 LET A=5
30 LET B=3
40 PRINT A+B
50 END
```



☐ The numbers on the left are **line numbers**. These tell the computer in which order to carry out the instructions. It will carry out the instruction with the lowest number first. Programs usually start with line 10, and go up in steps of 10. This is so that later, you can add extra lines in between.

☐ In this program, line 10 gives the program a name—"ADD". A program needs a name if it is going to be stored on cassette tape.

☐ Lines 20, 30 and 40 are the instructions for the computer.

☐ Line 50 tells the computer that the program has finished.

☐ When you type a program into a microcomputer, you must press the RETURN or NEWLINE key at the end of each line. To make the computer carry out the program, you have to type RUN. If you type RUN after the example program, the computer will print 8 on the screen.

*Unfortunately, all microcomputers use different types of BASIC. Programs in this book are suitable for the BBC Micro. Minor changes will have to be made to the programs if they are to be used on other micros. Your handbook will tell you what these changes should be.

Introduction

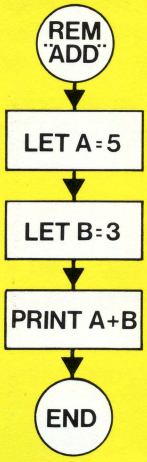
Writing Programs

☐ When you are writing a program it is important to write the instructions in the correct order. If you do not, the computer will not do what you want it to. Here is the example again, but with the lines in a different order.

```
10 REM "ADD"
20 LET A=5
30 PRINT A+B
40 LET B=3
50 END
```

☐ If you try to RUN this program, the computer will tell you there is a mistake. This is because line 30 tells the computer to PRINT A+B, but at line 30 it does not know what B is. This means that it cannot PRINT A+B. If the computer will not RUN a program and you want to see where you have made a mistake, type LIST. The computer will then display your program again.

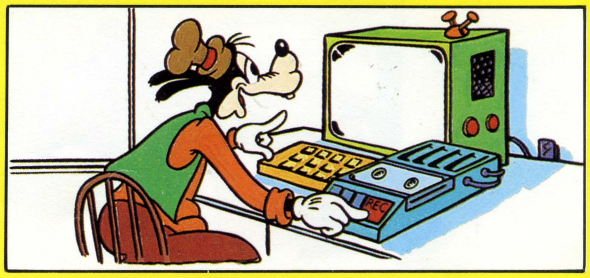
☐ One way of making sure that instructions are in the right order is to draw a **flowchart**. A flowchart is simply a picture of the program. Here is the flowchart for the example.



The flowchart shows the order in which the instructions should be given to the computer. The start and end of the program are in round boxes. Instructions to the computer are in rectangular boxes. If a program makes the computer ask questions or perform other tasks, these would be drawn in diamond shaped boxes.

Recording programs

As we have already said, if you want to record a program on cassette tape or floppy disk, you have to give the program a name. In the example the name was "ADD". You then have to type: SAVE "ADD", and press the record button on the cassette recorder. The program will then be saved on the tape to be used when you want it. When you want to use the program, you must type: LOAD "ADD". Make sure that the tape is at the beginning of the program and press the play button on the recorder. The program will then be loaded into the micro's RAM chip.



☐ Games 1–10 introduce other BASIC rules, statements and instructions that will help you to start programming a microcomputer.

Introduction

How Microcomputers Are Used

In offices
Microcomputers can be used to store all sorts of information—accounts, customers' addresses and sales records. They take up much less room than filing cabinets and make information-finding quicker and easier.

☐ Micros can also be connected to special printers to make **word processors** which can write letters automatically.

☐ It is also possible to link together micros in different towns. This means information can be sent from one office to another very quickly and accurately.

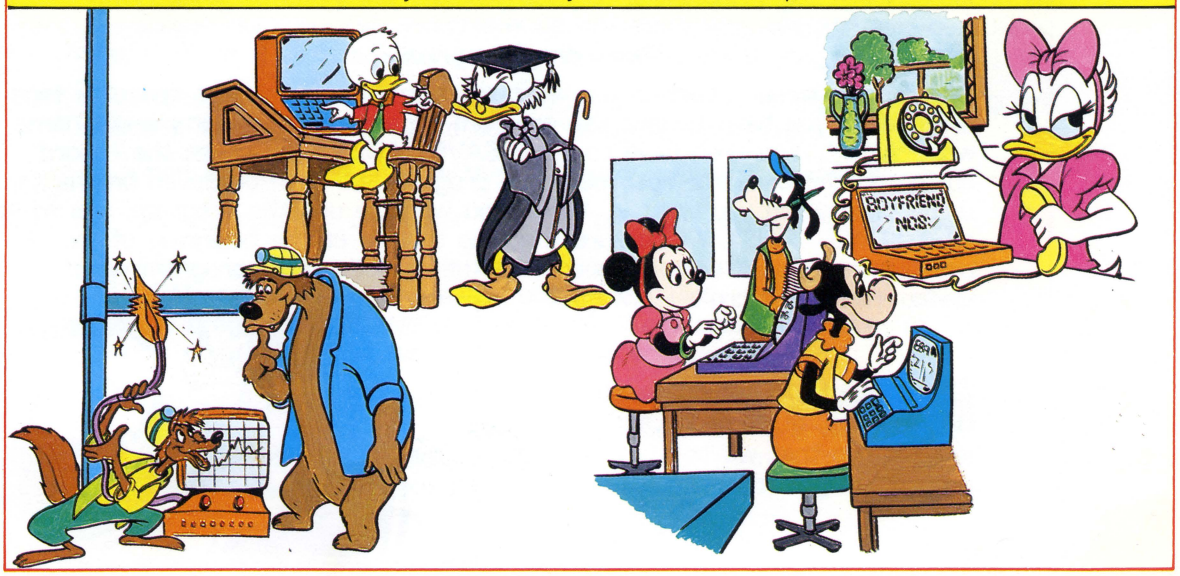
In factories
In factories, microcomputers are used to control other types of machinery, such as welding machines, machines for drilling and cutting, and robots. They can also be used to design new products using graphics. This is known as **Computer Aided Design** or CAD.

☐ Computers are also used to test things by using **simulations**. Computer simulations are models of the real world. This means that things can be safely tested before being used in practice. Simulations can also be used to train people—pilots use flight simulators before using real aeroplanes.

In schools
Microcomputers are now being used more and more in schools. They can help to teach almost any subject. Children learn to read and write, do sums, and even study foreign languages on micros.

In homes
Micros can be used in the home to play games, and to store information such as addresses or diary entries. Microprocessors are also used in many of the electrical things in the home. Washing machines, sewing machines, and cameras can all contain microprocessor chips.

☐ Games 11–16 show you more ways in which microprocessors can be used.



Introduction

Computer Toys And Games

Microcomputers are used in most of the video, TV and electronic games you see. Space Invaders, computer chess and programmable cars all have microprocessor chips inside them.

☐ Arcade games are very much like ordinary microcomputers. They contain a small computer, a special TV screen called a **monitor**, and a loudspeaker. Instead of a keyboard they have a few buttons. When the buttons are pressed, electronic signals are sent to the computer, which then sends signals to the screen.

☐ Hand-held electronic games have very small computers inside them, so they cannot perform as many actions as arcade games.

☐ TV games are also small computers, but only the microprocessor chip is inside the game box or **console**. The ROM chip is inside the cartridge you plug into the console. On the ROM chip is a computer program of the game. When the ROM chip is plugged in, the microprocessor carries out the instructions on it. Most TV games do not have RAM chips.

☐ The games you buy on cassette tape for microcomputers are also computer programs. When you play the tape, the program is loaded into the computer's RAM chip. When you RUN the program, you can play the game.

☐ Games 17–20 are like computer and TV games, but they can be played without a computer.

Game 1

Various Variables

YOU WILL NEED: PAPER AND PENCIL.

Variables are used to store information in the computer's memory. There are two main kinds of variable, one for numbers and one for letters and words.

Variables for numbers are called **numeric variables** and you write them like this:

LET A=5

This instruction tells the computer to call one space in its memory A and to put 5 in that space. The computer will never forget this until it is told to.

You can add, subtract, multiply and divide with numeric variables, using either other numbers or more variables.

Try this memory game with a friend. It uses two numeric variables.

1. Tell your friend that A=5
   Ask what A+3 equals
   Then ask what A−2 equals
2. Now tell your friend that B=10
   Ask what B×2 equals
   Then ask what B+2 equals
3. If they have got all these right, test if their memory is really good by asking what A+B equals.

Variables for letters and words are called **string variables**. If you want to store the word GOOFY in the computer's memory, you could not write LET G=GOOFY because the computer would not understand it. You have to write: LET G$="GOOFY"

This tells the computer to call one space in its memory G$. The $ sign means that only letters or words can be stored there. You must put the words you want to be stored in quotation marks, "GOOFY".

You cannot subtract, multiply or divide using string variables, but you can add them together like this:

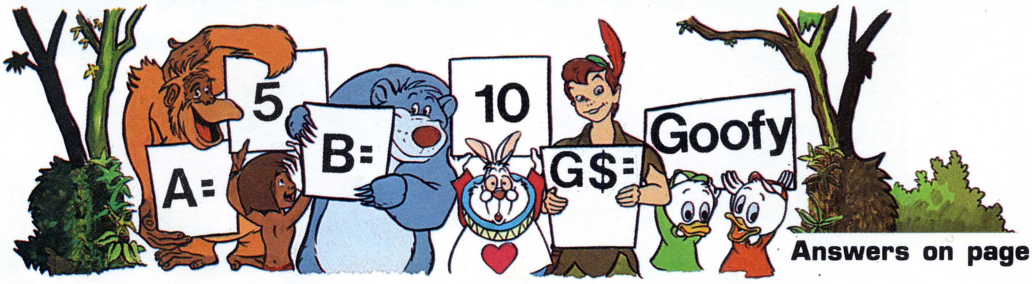
LET A$="DON" LET B$="ALD" A$+B$=DONALD

Try adding these string variables up to see what they say.

1. LET R$="BAM"
   LET T$="BI"
2. LET V$="FAN"
   LET W$="TASIA"
3. LET X$="ARIS"
   LET Y$="TO"
   LET Z$="CATS"

Try adding these strings together and see what funny words you get.

V$+R$=
T$+Z$=
Y$+W$=
V$+Z$+X$+Y$+R$=



Answers on page 44.

Game 2

Spelling Strings

YOU WILL NEED: PAPER AND PENCIL.

String variables are lists of letters or words that can be stored in the computer's memory. By using special commands, the computer can split string variables up.

These commands are:

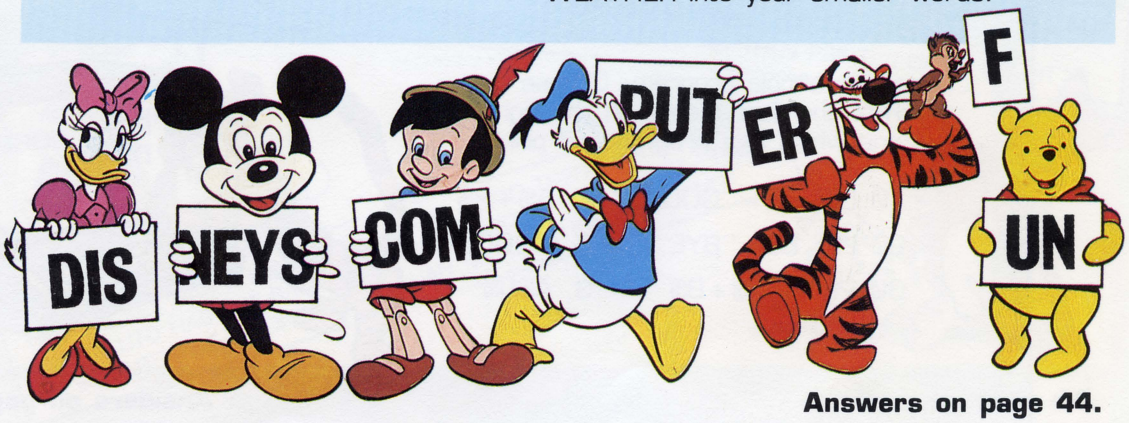
LEFT$[X,Y] RIGHT$[X,Y] MID$[X,Y]

X and Y refer to the number of letters in a string. Here is an example.

LET A$ = "NOTHING"	Nothing has 7 letters numbered 1–7 from the left.
LEFT$[1,3] = NOT	This chooses the 1st, 2nd and 3rd letters on the left of the string.
RIGHT$[3,7] = THING	This chooses the last 5 letters on the right of the string, starting at the 3rd letter.
MID$[3,6] = THIN	This chooses letters in the middle of the string, starting at the 3rd letter and ending at the 6th.

Here are some strings for you to split up. Write your answers on the paper.

1. LET A$ = "NUMBER"	What is LEFT$[1,4]?
2. LET B$ = "PROGRAM"	What is RIGHT$[5,7]?
3. LET C$ = "COMPUTER"	What is MID$[4,6]?
4. LET D$ = "STRING"	What is RIGHT$[3,6]?
5. LET E$ = "INPUT"	What is LEFT$[1,2]?
	What is RIGHT$[3,5]?
6. LET F$ = "RUSHED"	What is LEFT$[1,4]?
	What is RIGHT$[3,6]?
	What is MID$[2,3]?
7. LET G$ = "MISTAKE"	What is LEFT$[1,4]?
	What is RIGHT$[4,7]?
	What is RIGHT$[3,7]?
	What is MID$[2,3]?
8. LET H$ = "WEATHER"	How many small strings can you make from WEATHER?
	Write down the commands that would be needed to make the computer split WEATHER into your smaller words.



Answers on page 44.

Game 3

Print Posers

The PRINT command makes the computer write numbers and words on the screen.

To print a number, all you have to do is type

```
PRINT 3
```

and a 3 will appear on the screen. PRINT can also do sums:

```
PRINT 3+4
```

will write a 7 on the screen, and

```
PRINT 4/2
```

will write a 2.

To write words on the screen you need to use quotation marks.

```
PRINT POOH BEAR
```

will not work, but

```
PRINT "POOH BEAR"
```

will write POOH BEAR on the screen.

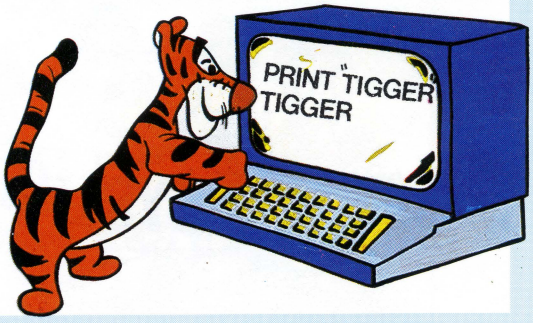
Here is a game using the PRINT command.

On the left is a list of PRINT commands. On the right is a list of numbers and words. What you have to do is to choose which words and numbers go with each of the commands.

PRINT HELLO	2
PRINT "HELLO"	Mistake
PRINT 10/5	4
PRINT 2*2*2	HELLO
PRINT 10*10*10/10	8
PRINT 2+2	100

Here is a simple program. Choose which of the statements on the right is the one which this program will print.

10 LET A$="GOOD"	1. A$+B$
20 LET B$="BYE"	2. GOODBYE
30 PRINT A$+B$	3. AB



Answers on page 44.

Game 9

Computer Comparison

YOU WILL NEED: A RULER, PENCIL AND PAPER.

The computer compares information by using the IF . . . THEN command. This command is usually followed by another instruction such as PRINT.

Here is an example:

IF 3 is greater than 1 THEN PRINT "YES"

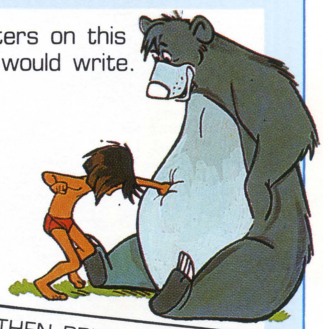
In computer language, 'greater than' is written like this >
'Less than' is written like this <
'Equal to' is written like this =
'Not equal to' is written like this <>

So the example should be written:

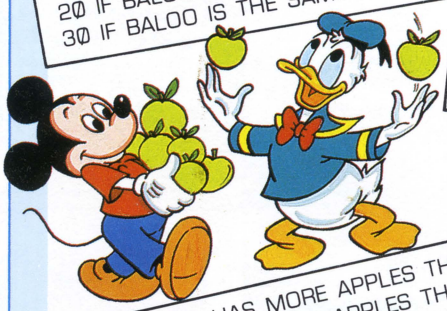
IF 3>1 THEN PRINT "YES"

Here is a list of short programs which compare the Disney characters on this page. Look at the characters and decide which word the computer would write.

```
10 IF BALOO IS FATTER THAN MOWGLI THEN PRINT "YES"
20 IF BALOO IS THINNER THAN MOWGLI THEN PRINT "NO"
30 IF BALOO IS THE SAME SIZE AS MOWGLI THEN PRINT "WRONG"
```

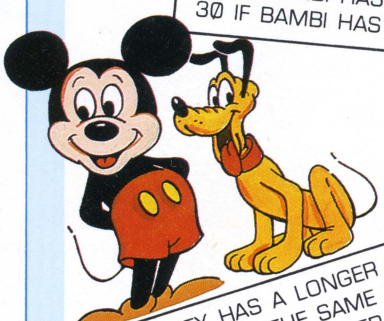


```
10 IF PIGLET IS BIGGER THAN POOH THEN PRINT "SILLY"
20 IF PIGLET IS THE SAME SIZE AS POOH THEN PRINT "BAD"
30 IF PIGLET IS SMALLER THAN POOH THEN PRINT "GOOD"
```

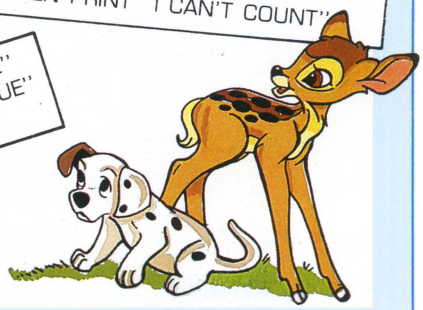


```
10 IF DONALD HAS MORE APPLES THAN MICKEY THEN PRINT "NO"
20 IF MICKEY HAS MORE APPLES THAN DONALD THEN PRINT "YES"
```

```
10 IF BAMBI HAS THE SAME NUMBER OF SPOTS AS THE DALMATIAN THEN PRINT "NO"
20 IF BAMBI HAS MORE SPOTS THAN THE DALMATIAN THEN PRINT "YES"
30 IF BAMBI HAS LESS SPOTS THAN THE DALMATIAN THEN PRINT "I CAN'T COUNT"
```



```
10 IF MICKEY HAS A LONGER TAIL THAN PLUTO THEN PRINT "FALSE"
20 IF PLUTO HAS THE SAME SIZE TAIL AS MICKEY THEN PRINT "TRUE"
30 IF PLUTO HAS A LONGER TAIL THAN MICKEY THEN PRINT "NO"
```



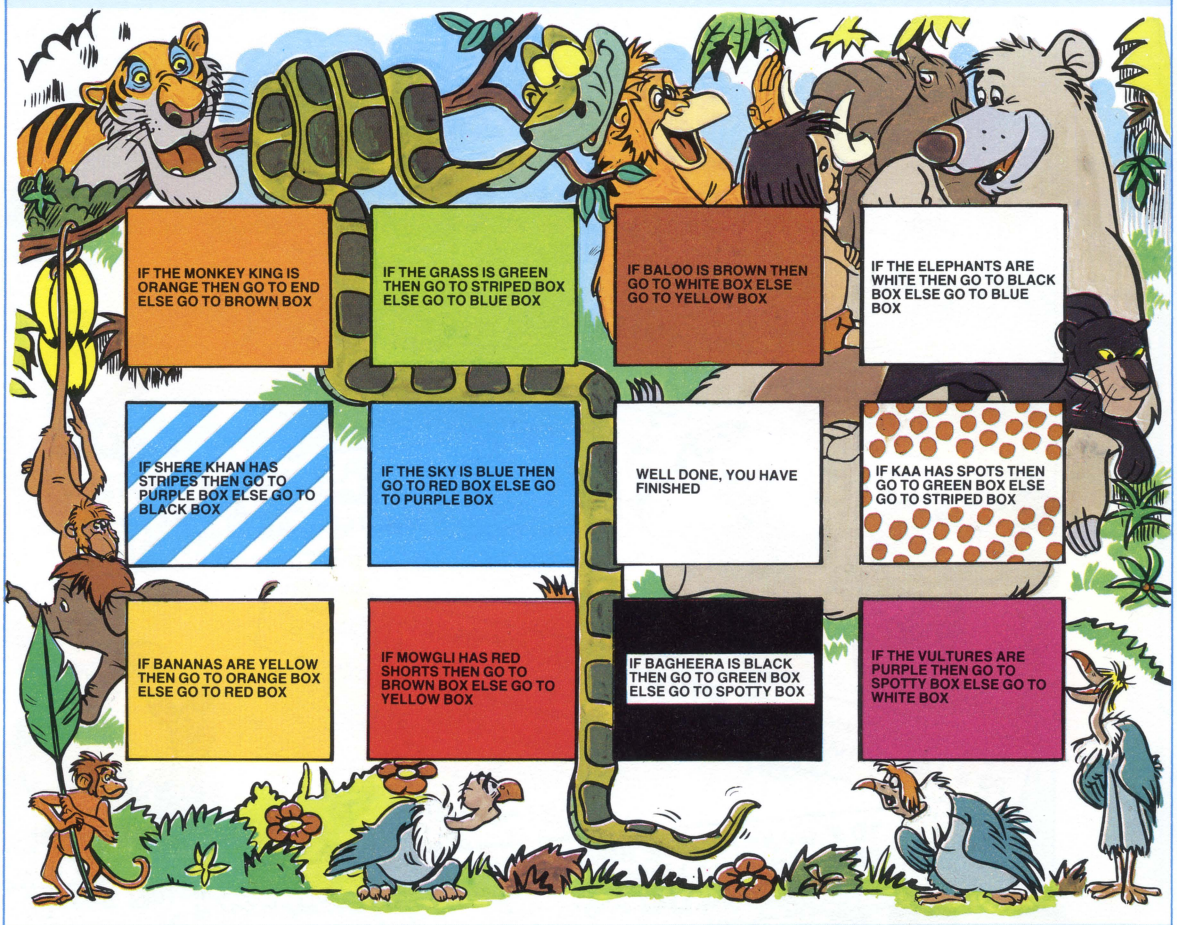
Answers on page 44.

Game 5

Goto Game

This game is like a simple computer program. It uses the computer commands IF . . . THEN . . . ELSE and GOTO.

Starting at the black box, answer the question in the box and then go to the next box. Which box you go to next will depend on your answer. There is always a choice of two and you should use the pictures of Jungle Book characters around the page to help you.



You could write the first box on the computer like this:

```
10 PRINT "IS THE MONKEY KING ORANGE"
20 INPUT A$
30 IF A$="YES" THEN GOTO 500 ELSE GOTO 200
```

Line 500 would be the END and line 200 would be the BROWN BOX. When you write programs using GOTO you must make sure that you do not go round and round in circles like this:

```
50 PRINT "BALOO"
60 GOTO 50
```

This would print BALOO forever because it makes a loop. This is a bad program because there are special commands to make loops which do not go on forever.

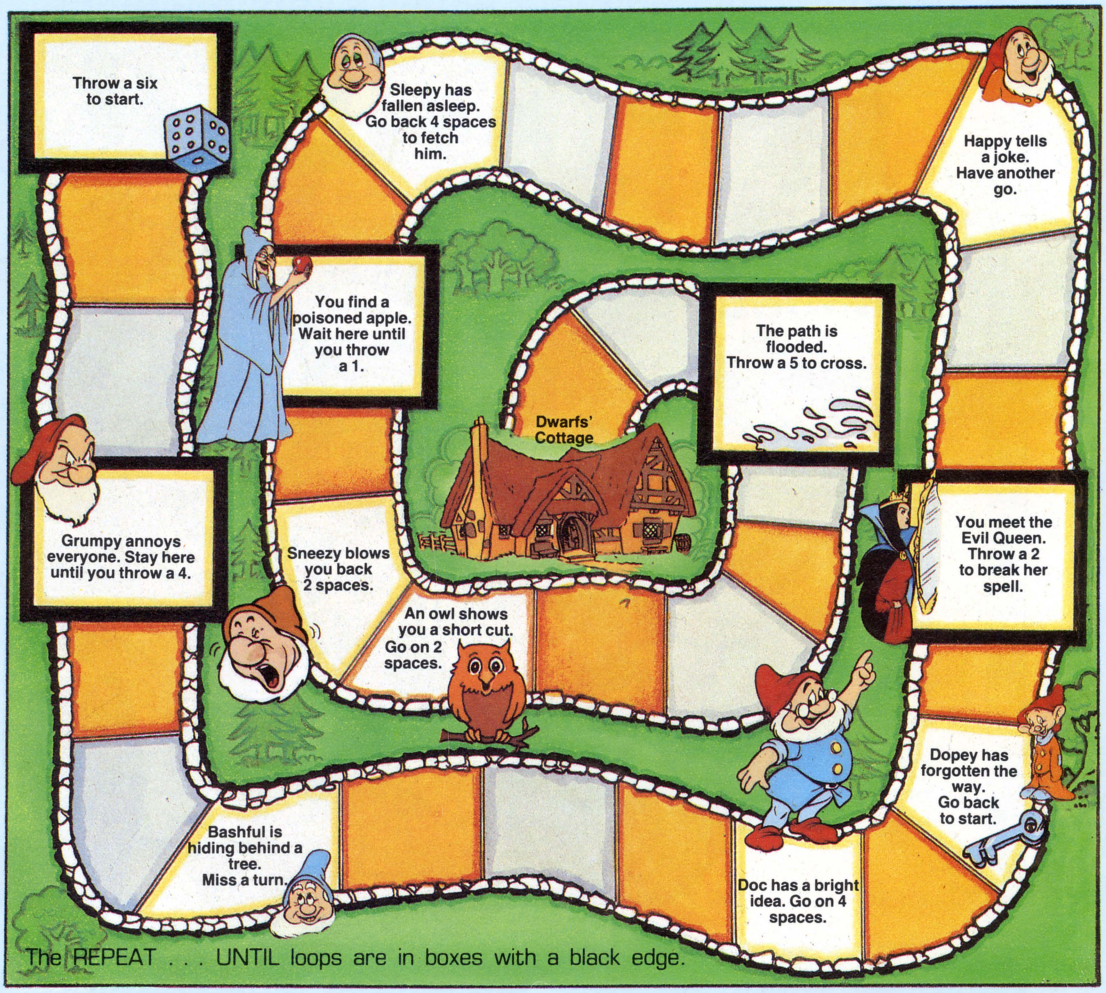
Game 6

Repeat...Until Race

YOU WILL NEED: A DICE AND COLOURED COUNTERS.

The REPEAT . . . UNTIL command makes the computer repeat a task any number of times until a certain point or target is reached. This command makes a loop which you can control. The computer will go round and round until told to stop.

This game is a simple board game which shows how a REPEAT . . . UNTIL loop can be used.
The aim of the game is to follow the path through the woods from Snow White to the dwarfs' cottage. The winner is the first player to reach the cottage.



The REPEAT . . . UNTIL loops are in boxes with a black edge.

You can make the computer act like a dice with a program like this:

```
10 REPEAT
20 S=RND(6)
30 PRINT S
40 UNTIL S=6
```

This program makes the computer 'throw' the dice until a 6 is thrown. If you forget to put an instruction after UNTIL the program will go round and round forever.

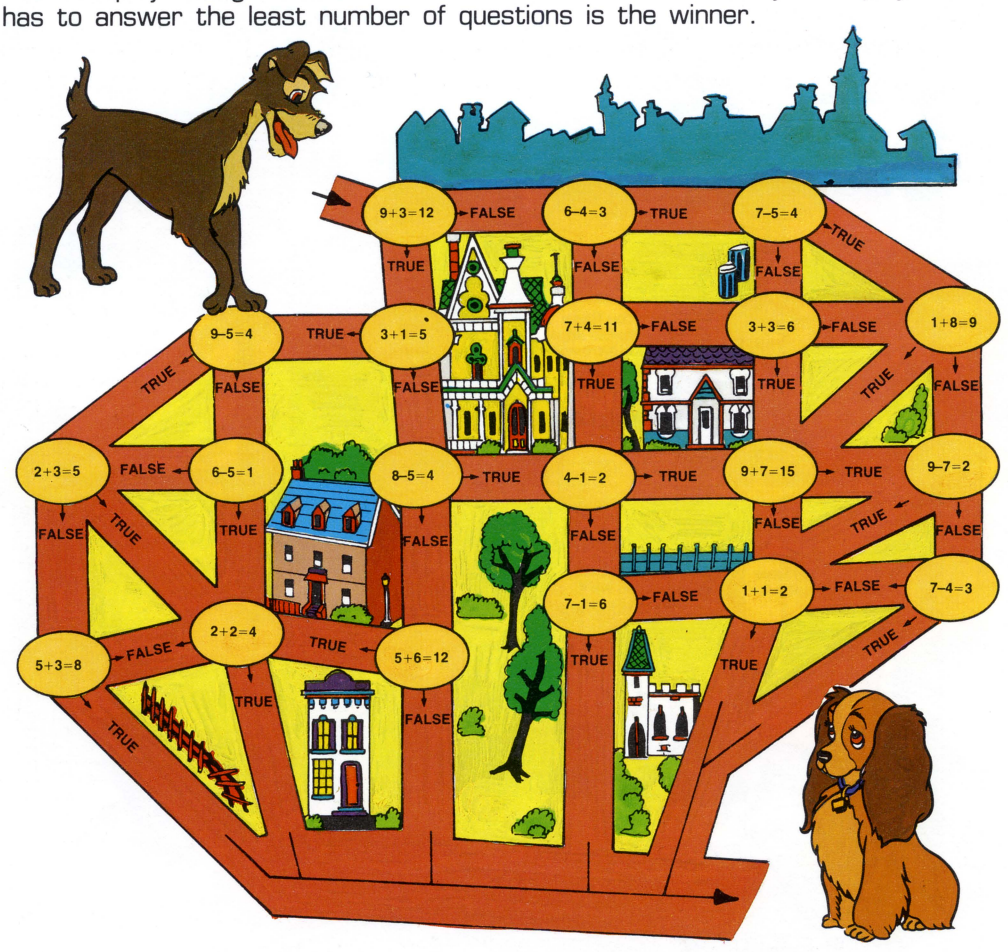
Game 7

True...False Teaser

This game is based on another simple program which uses the commands TRUE, FALSE, IF . . . THEN and GOTO.

Lady has lost her way in the town. The only way that Tramp can find her is by using the map below. At each street corner, Tramp will have to answer a question to see which way to go. The answer to each question is either true or false, and you must help Tramp by deciding which answer is correct. If you answer the questions correctly, Tramp will find Lady quickly.

You can play this game with a friend. Take turns to find Lady. The player who has to answer the least number of questions is the winner.



On the computer, each question could be written like this:

```
10 PRINT "9+3=12, TRUE OR FALSE?"
20 INPUT A$
30 IF A$="TRUE" THEN GOTO 110
40 IF A$="FALSE" THEN GOTO 160
```

Line 110 would be left and line 160 straight on.

Game 8

Plotting Pictures

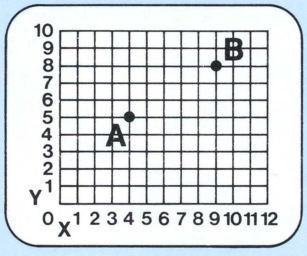
YOU WILL NEED: PENCIL, PAPER AND RULER.

You can make a computer draw by using the PLOT X,Y and DRAW X,Y commands. PLOT X,Y draws a spot on the screen and DRAW X,Y draws a line from one point to another.

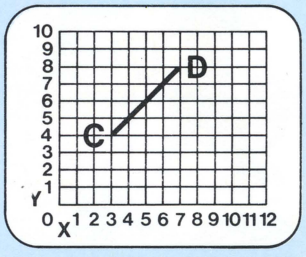
X,Y gives the position of a point on the screen. The computer divides the screen into a grid with lots of points on it. These points are called **pixels**. X gives the number of points a pixel is across the screen. Y gives the number of points a pixel is up the screen.

Here is a simple screen with 12 points across and 10 points up.

The spot at point A is drawn by the command PLOT 4,5 — 4 points across the screen and 5 up. Point B is drawn by the command PLOT 9,8 — 9 points across and 8 up.



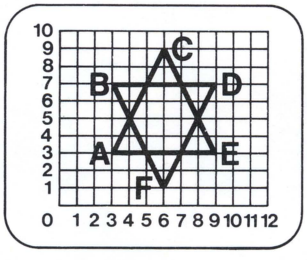
The computer can only draw lines from one point to another. You must first draw a spot. You can then draw a line from that spot to any other pixel.



The line C to D is drawn using the commands PLOT 3,4 and DRAW 7,8.

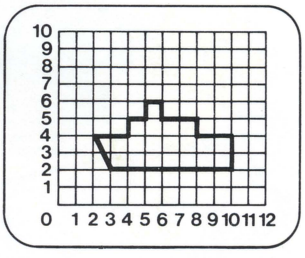
Now try to answer the following questions.

1. Write down the X and Y values for the corners of the star.



2. Write a computer program using PLOT X,Y and DRAW X,Y to draw the star.

3. Write a computer program using PLOT X,Y and DRAW X,Y to draw this ship.



4. Using a ruler, draw a grid with 12 points across and 10 points up. Draw this program on your grid. What does it show?

```
10 PLOT 6,2
20 DRAW 6,4
30 DRAW 3,4
40 DRAW 6,6
50 DRAW 4,6
60 DRAW 6,8
70 DRAW 5,8
80 DRAW 6,9
90 DRAW 7,8
100 DRAW 6,8
110 DRAW 8,6
120 DRAW 6,6
130 DRAW 9,4
140 DRAW 6,4
```

Note: On the BBC computer you need to type PLOT 69,X,Y to draw a spot.

Answers on page 44.

Game 9

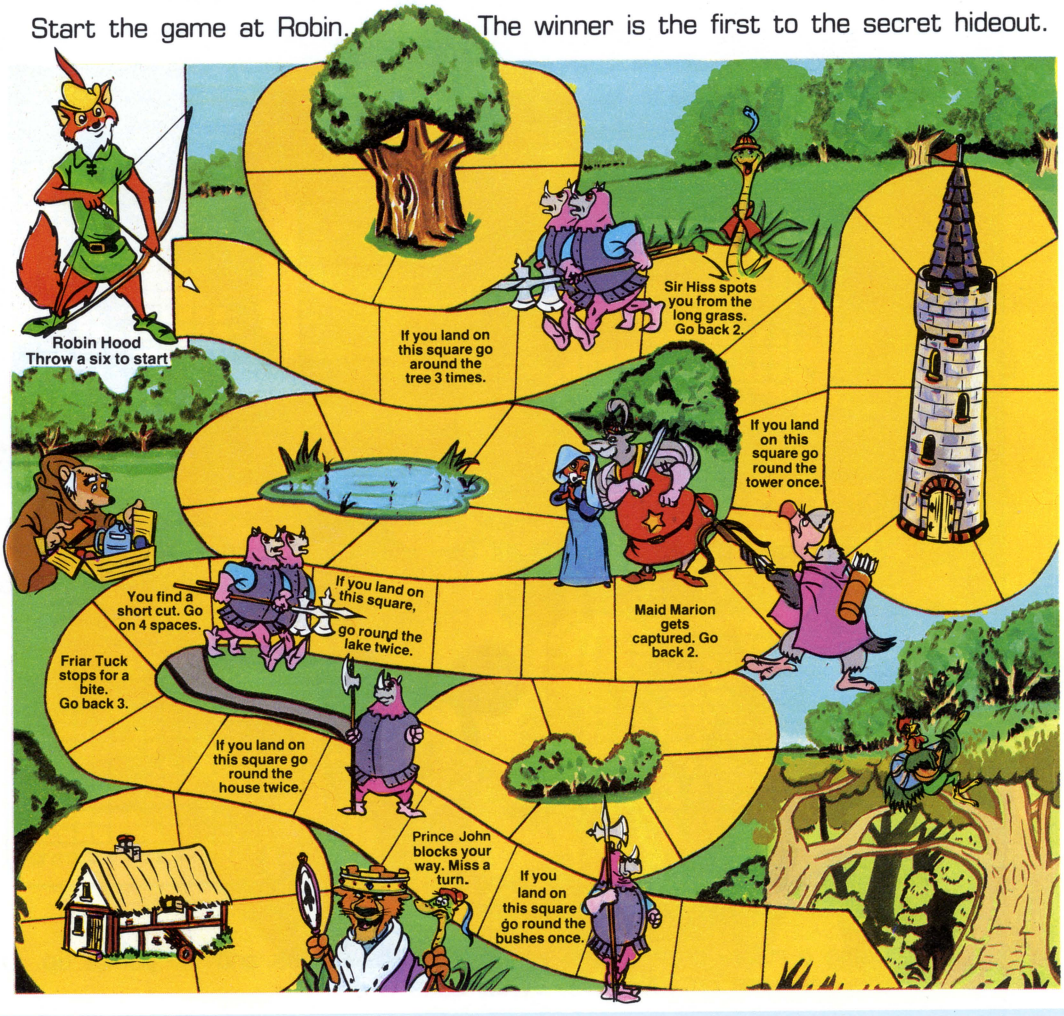
For...Next Fun

YOU WILL NEED: A DICE AND COLOURED COUNTERS.

The FOR . . . NEXT command makes the computer repeat a certain task for a given number of times. Like REPEAT . . . UNTIL, this command sets up a loop.

Robin Hood is trying to escape from the Sheriff of Nottingham. He is running through Sherwood Forest to get to his secret hideout. In the forest, there are lots of the Sheriff's men trying to catch Robin. This means he often has to make detours to throw them off his trail.

Start the game at Robin. The winner is the first to the secret hideout.



Here is how you write a FOR . . . NEXT loop on the computer:

```
10 FOR A=1 TO 6
20 FOR B=1 TO 3
30 PRINT A,B
40 NEXT B
50 NEXT A
```

This program makes the computer print B three times every time it prints A.

In the game, this could be written as, 'each time you land on a black square, you have to go around the tree three times'.

Game 10

Bug Blaster

Bugs is the name for mistakes in programs. If a program has a bug in it, the computer will not run the program.

Tron has written a number of short computer programs, but the computer will not run them because they all have bugs in them. Help Tron by finding what the bugs are and in which line they appear.

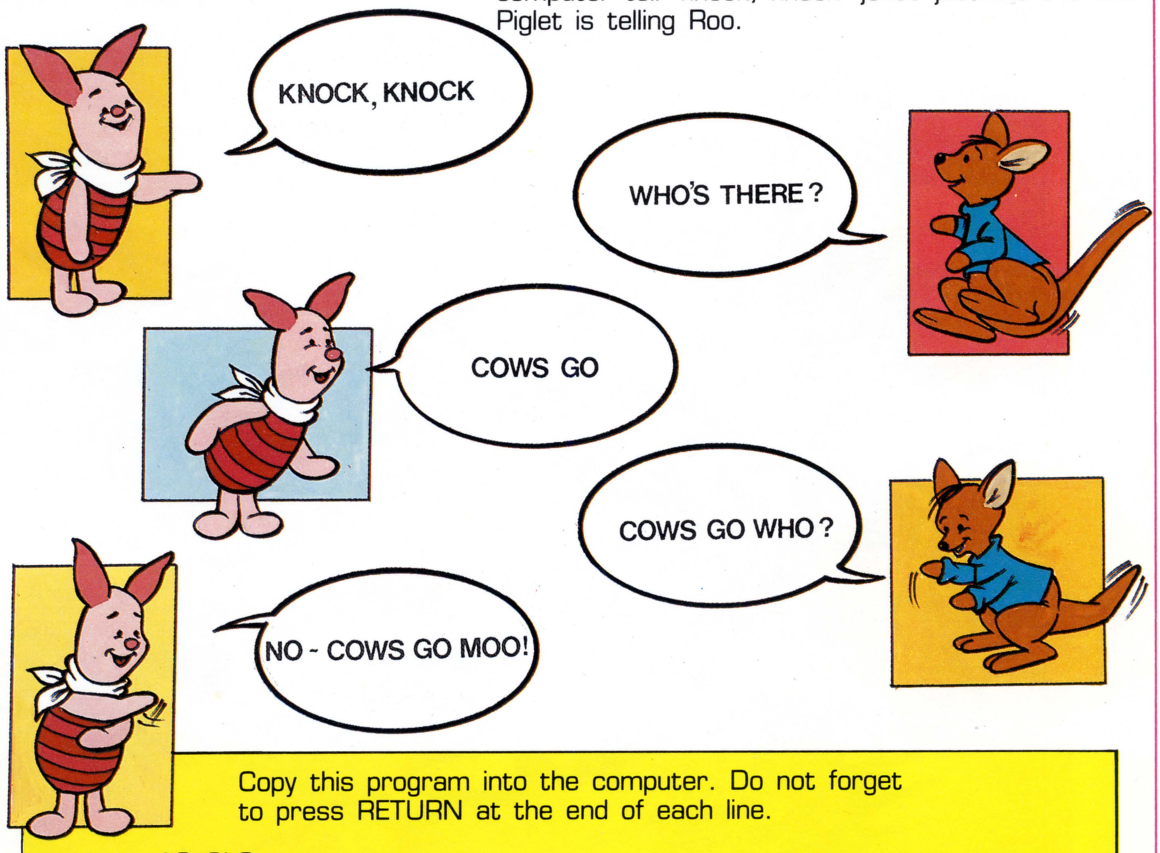
You may have to look at the previous games to help you.

Answers on page 45.

Program 1

Tell A Joke

The computer program on this page makes the computer tell 'knock, knock' jokes just like the one Piglet is telling Roo.



Copy this program into the computer. Do not forget to press RETURN at the end of each line.

```
10 CLS
20 PRINT "TELL A JOKE"
30 PRINT
40 PRINT "KNOCK, KNOCK"
50 R$="WHO'S THERE?"
60 INPUT Q$
70 IF Q$=R$ THEN PRINT "COWS GO" ELSE GOTO 130
80 W$="COWS GO WHO?"
90 INPUT T$
100 IF T$=W$ THEN PRINT "NO — COWS GO MOO! HA! HA!"
110 PRINT
120 PRINT "WELL DONE!": GOTO 150
130 PRINT "TRY AGAIN": GOTO 60
140 PRINT "TRY AGAIN": GOTO 90
150 END
```

Now you can try the program on your friends. Just type RUN. Make sure you write your replies just like Roo's or the computer will not understand you.

You can use this program for any 'knock, knock' joke. All you have to do is to change the words in quotation marks in lines 70, 80 and 100.

Program 2

Tell Another Joke

This is another computer program that tells jokes. This one tells jokes like the one the Fox is telling the Hound.

Copy this program into the computer.
Do not forget to press RETURN at the end of each line.

```
10 CLS
20 PRINT "TELL ANOTHER JOKE"
30 PRINT
40 PRINT "WHAT DID THE POLICEMAN SAY TO HIS TUMMY?"
50 A$="YOU'RE UNDER A VEST"
60 B$="I DON'T KNOW"
70 INPUT C$
80 IF C$=A$ THEN PRINT "THAT'S RIGHT, WELL DONE": GOTO 110
90 IF C$=B$ THEN PRINT "YOU'RE UNDER A VEST! HA! HA!"
   GOTO 110
100 PRINT "NO, HAVE ANOTHER GO": GOTO 70
110 END
```

Now you can try it on your friends or your Mum and Dad. Just type RUN. Make sure you type in your replies the same as the Hound's or the computer will not understand you.

You can use this program for any joke of this sort. All you have to do is change the words in quotation marks in lines 40, 50 and 90 to fit your new joke.

Game 11

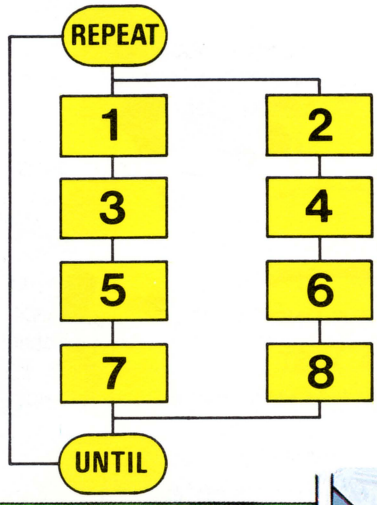
Traffic Light Test

Microcomputers can be used to control all types of electronic machines, from sewing machines to spaceships, from toy cars to traffic lights.

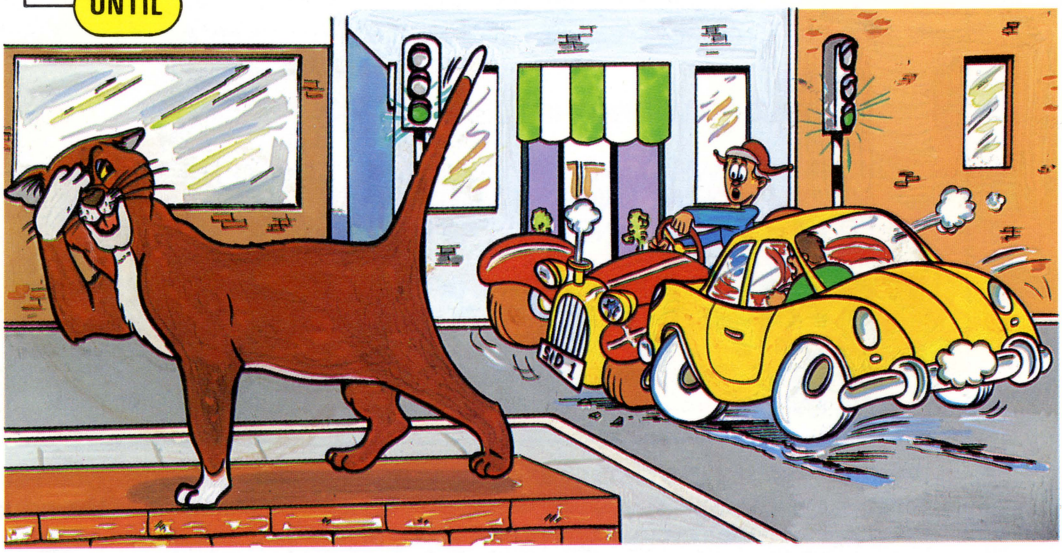
O'Malley is trying to write a program to control these traffic lights. As you can see, he is not having much luck. He has worked out all the instructions that are needed, but he cannot put them in the right order.

Help him out by deciding which of the instructions on the right go in which of the boxes in the flowchart.

Traffic light No. 1 controls the cars on the side road and traffic light No. 2 controls the cars on the main road. Twice as many cars use the main road than the side road.



A. Traffic light No. 1 on red for 60 seconds
B. Traffic light No. 2 on amber for 5 seconds
C. Traffic light No. 2 on green for 60 seconds
D. Traffic light No. 1 on green for 30 seconds
E. Traffic light No. 2 on red and amber for 5 seconds
F. Traffic light No. 1 on amber for 5 seconds
G. Traffic light No. 2 on red for 30 seconds
H. Traffic light No. 1 on red and amber for 5 seconds



Answers on page 45.

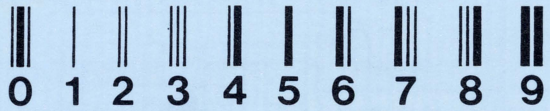
Game 12

Bar Code Breaker

YOU WILL NEED: A PENCIL AND PAPER.

Microcomputers cannot yet read numbers and letters, but using a special pen they can read patterns. Some patterns can be used for storing information, and when the pen is passed over the pattern, the information is fed into the computer. Such a pattern is the bar code you can find on packets, tins and jars in a supermarket. There is even one on the back of this book. Here is how they work.

The first ten numbers are each given a code in the form of a series of lines or bars.

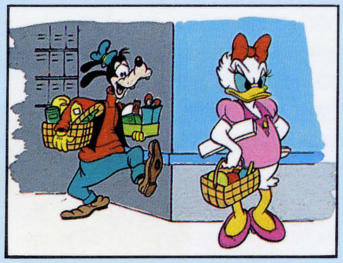


The numbers can be given any type of line or bar — the one above is a special Disney code. A few of these bars are then drawn on a label to form a pattern. This pattern can give all sorts of information.

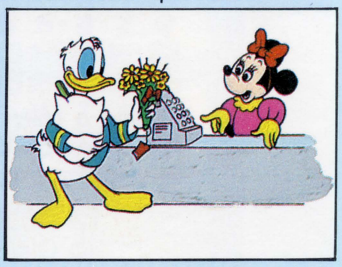
Every product in a supermarket usually has a code number and a price. For example, strawberry jam in the Disney Supermarket has a code number of 432 and a price of 45 pence. This information can be written as a bar code.

Bar codes are useful because a cashier can use a special pen to read the code instead of pushing all the buttons on the till. This makes the job much easier, and means fewer mistakes are made. The computer can also be linked to the warehouse. This means that each time a customer buys some jam, the warehouse will be told automatically, and will know when to order some more.

The Disney Supermarket also sells clothes. Here is a list of clothes it sells with their code numbers and prices. Use this list to answer the bar code questions.



	Code number	Price
Shirt	837	£2.99
Socks	139	£0.85
Shorts	246	£1.60
Jumper	310	£3.25
Shoes	525	£4.70
Hat	409	£0.88



1. Draw the bar code for a hat.

2. Draw the bar code for a shirt.

3. What is this bar code for?

4. What is this bar code for?

Try making up your own bar codes and testing them on your friends.

Answers on page 45.

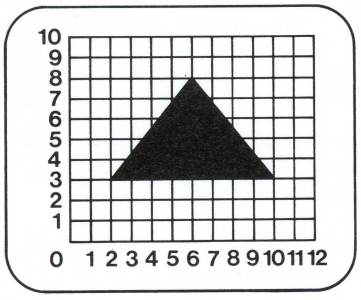
Game 13

Great Graphics

YOU WILL NEED: PENCIL, RULER AND PAPER.

In GAME 8 you saw how computers draw spots and lines. Computers can also draw more complicated pictures by colouring areas in. They can do this in lots of different colours as well as black and white.

Here is the simple screen again, with 12 points across and 10 points up.



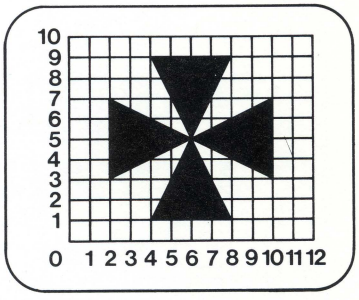
To draw this triangle, you would have to give the computer these instructions:

```
PLOT 69,2,3    This draws a spot at 2,3
PLOT 69,6,8    This draws a spot at 6,8
PLOT 85,10,3   This draws a triangle
                 between 2,3 and 6,8 and
                 10,3 and then shades it in.
```

PLOT 85,X,Y will shade in any triangle between X,Y and the last two points drawn.

Here is another screen with a cross drawn on it. The cross is made up of 4 triangles.

1. Write down the X and Y values of the top triangle.
2. Write the computer program to draw the top triangle.
3. Write the computer program for the whole cross.



Using a ruler draw a grid with 12 points across and 10 points up. Draw this program on the grid. Do not forget to shade in the correct areas. What does the picture show?

```
10 PLOT 69,7,0
20 DRAW 3,4
30 DRAW 3,7
40 DRAW 0,7
50 PLOT 85,3,8
60 DRAW 4,9
70 DRAW 5,8
80 DRAW 5,4
90 DRAW 8,1
100 DRAW 8,3
110 PLOT 85,5,4
120 DRAW 9,5
130 PLOT 85,9,4
140 DRAW 11,4
150 DRAW 12,7
160 DRAW 12,5
170 PLOT 85,11,4
180 DRAW 12,4
190 DRAW 12,2
200 PLOT 85,11,4
210 DRAW 7,0
```

Note: The PLOT 85,X,Y command can be used with the BBC computer only. Other computers will have different commands to shade triangles.

Answers on page 45.

Game 19

Queue Quiz

YOU WILL NEED:
A PENCIL, RULER, DICE AND PAPER.

Computers have many uses in business. One of their most common uses is to help people make decisions. They can do this by simulating the real world.

Goofy is opening a shop. He knows that every 5 minutes, between 1 and 6 customers will come into the shop. Goofy also knows that each sales assistant can serve 1 customer every 5 minutes.

He wants to know how many sales assistants he needs for there never to be a queue of more than 3 customers.

To make this decision, he needs to simulate the shop. This is how to do it.

1 Divide the day into 5 minute periods.

2 Throw a dice. Use the score to show the number of customers coming in every 5 minutes.

3 Add this to the number of customers waiting (there will be none in the first period) to find:

4 The total number of customers.

5 With 1 sales assistant, 1 customer is served each period.

6 This leaves 1 customer waiting at the start of the next period.

5 minute periods			
1	2	3	....
2	4	1	
0	1	4	
2	5	5	
1	1	1	
1	4	4	

In the second period, 4 people come into the shop. There is already 1 waiting, so this makes 5 in total. Only 1 can be served, so 4 will be waiting in the next period.

You can keep repeating this for as long as you like, but 12 periods or 1 hour is long enough. Here is the completed table for 1 hour.

5 minute periods	1	2	3	4	5	6	7	8	9	10	11	12
Customers coming in	2	4	1	2	3	3	2	6	5	4	2	2
Customers waiting	0	1	4	4	5	7	9	10	15	19	22	23
Total customers	2	5	5	6	8	10	11	16	20	23	24	25
Customers served	1	1	1	1	1	1	1	1	1	1	1	1
Customers waiting	1	4	4	5	7	9	10	15	19	22	23	24

This shows that there will be nearly always more than 3 customers queuing, and by the end of one hour there will be 24 waiting. So, Goofy needs more than 1 sales assistant.

Draw another table like this one for 2 assistants. Throw a dice again for the number of customers and work out the queues. Do not forget that 2 customers can be served each period with 2 assistants.

If Goofy needs more than 2 assistants, repeat the table for 3 assistants, then 4 assistants and so on, until you have queues of 3 customers or less. The answer is given on page 45.

If Goofy had a computer, he could simulate a whole day and not just one hour. This would give Goofy more accurate results and the computer could do it more quickly than you.

Game 15

Robin's Robot

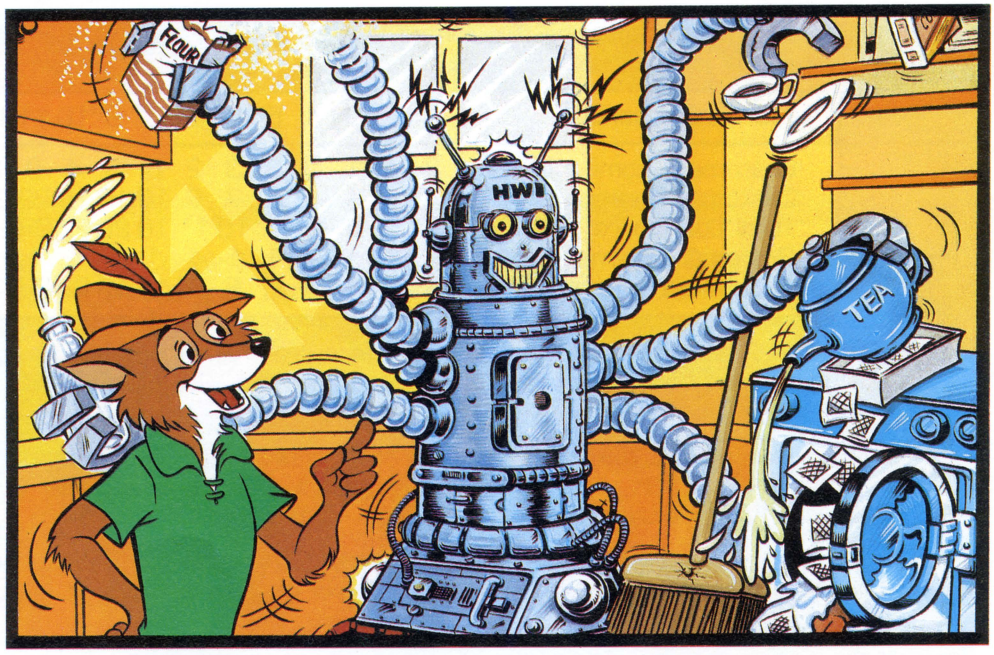
YOU WILL NEED A PENCIL AND PAPER.

Robots are very good at doing repetitive and boring jobs. There is one boring job that Robin Hood does not like—making the tea. He has bought a robot to help him make tea.

Microcomputers can be used to control robots. The computer acts as the robot's 'brain'. All you have to do is to program the computer to make the robot do what you want.

Here is a list of kitchen instructions. Choose the 10 instructions that Robin will need to program the robot to make tea. You must also put them in the right order if you want the robot to make tea properly.

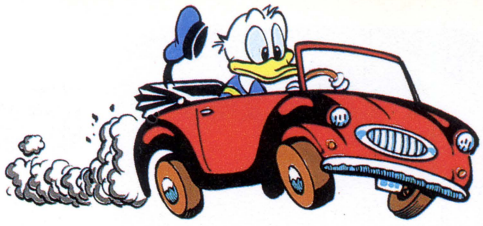
Put the ice cream in the fridge.
Switch the kettle on.
Put milk in the cups.
Plug the kettle in.
Put coffee in the cups.
Pour water into the teapot.
Scrub the floor.
Wait until the kettle boils.
Beat 4 eggs.
Mix flour and water.
Fill the kettle with water.
Wait until the tea has brewed.
Weigh 250g of sugar.
Pour tea in the cups.
Switch the percolator off.
Switch the kettle off.
Put tea in the teapot.
Do the washing up.
Fry some bacon.



Answers on page 45.

Game 16

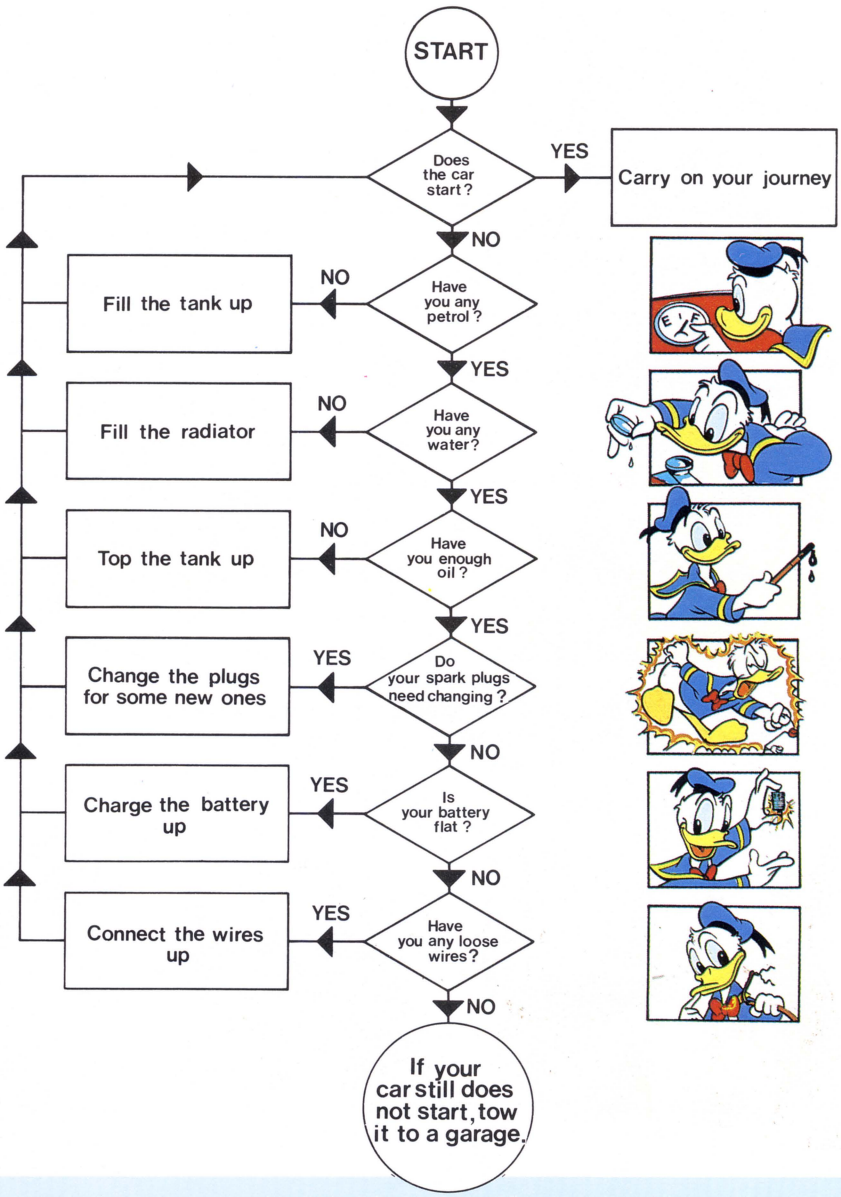
Car Care



Computers can be very useful to help people diagnose things. Doctors can use them to diagnose illnesses and mechanics can use them to diagnose faults in cars.

Donald Duck has been out driving and his car has broken down. Donald has telephoned a garage where the mechanic has a computer. The computer asks the mechanic questions about the car and tells him what needs to be done.

Starting at the top of this flowchart, find out what is wrong with Donald's car. Use the pictures around the page to help you.



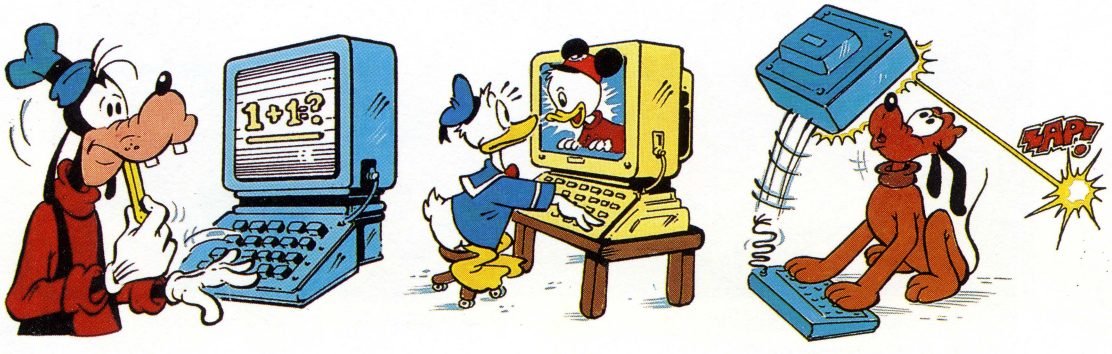
Program 3

Print A Picture

This computer program draws a picture of a Disney character on the screen. It uses the PRINT command and string variables. Find out who the character is by running the program. Take care when copying the program into the computer. Make sure to press RETURN at the end of each line.

```
 10 CLS
 20 Q$ = CHR$[ - 1]
 30 Z$ = " "
 40 A$ = STRING$[1,Q$]
 50 B$ = STRING$[2,Q$]
 60 C$ = STRING$[3,Q$]
 70 D$ = STRING$[4,Q$]
 80 E$ = STRING$[5,Q$]
 90 F$ = STRING$[6,Q$]
100 G$ = STRING$[7,Q$]
110 H$ = STRING$[8,Q$]
120 I$ = STRING$[10,Q$]
130 J$ = STRING$[1,Z$]
140 K$ = STRING$[2,Z$]
150 L$ = STRING$[3,Z$]
160 M$ = STRING$[4,Z$]
170 N$ = STRING$[5,Z$]
180 O$ = STRING$[7,Z$]
190 P$ = STRING$[9,Z$]
200 PRINT
210 PRINT
220 PRINT TAB[12];D$;P$;K$;D$
230 PRINT TAB[11];F$;P$;F$
240 PRINT TAB[10];H$;O$;H$
250 PRINT TAB[9];I$;N$;I$
260 PRINT TAB[9];I$;N$;I$
270 PRINT TAB[9];I$;J$;C$;J$;I$
280 PRINT TAB[10];I$;I$;C$
290 PRINT TAB[10];H$;L$;A$;L$;H$
300 PRINT TAB[11];F$;P$;F$
310 PRINT TAB[12];C$;J$;A$;P$;A$;J$;C$
320 PRINT TAB[16];A$;P$;A$
330 PRINT TAB[16];A$;P$;A$
340 PRINT TAB[15];B$;P$;B$
350 PRINT TAB[15];B$;L$;A$;K$;A$;K$;B$
360 PRINT TAB[15];B$;K$;B$;J$;B$;K$;B$
370 PRINT TAB[14];C$;P$;C$
380 PRINT TAB[13];B$;M$;E$;M$;B$
390 PRINT TAB[12];B$;K$;A$;J$;G$;J$;A$;K$;B$
400 PRINT TAB[12];A$;L$;A$;K$;E$;K$;A$;L$;A$
410 PRINT TAB[12];A$;M$;A$;J$;A$;M$;A$
420 PRINT TAB[12];B$;M$;A$;N$;A$;M$;B$
430 PRINT TAB[13];B$;M$;E$;M$;B$
440 PRINT TAB[14];B$;M$;C$;M$;B$
450 PRINT TAB[15];B$;P$;B$
460 PRINT TAB[16];B$;O$;B$
470 PRINT TAB[17];C$;L$;C$
480 PRINT TAB[19];E$
```

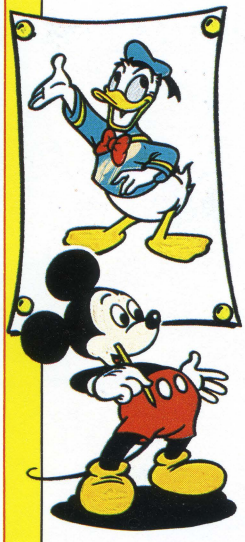
This program is designed for black and white screens. On the BBC computer you should type MODE 4 before using this program.



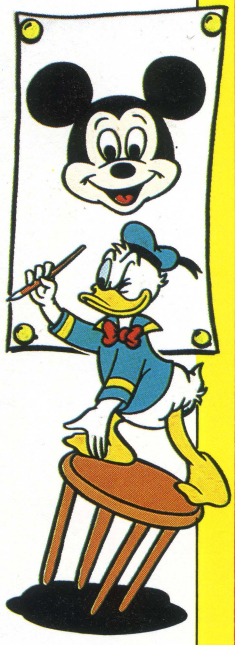
Program 4

Disney Draw

This is another computer program that draws a picture. This program uses the PLOT and DRAW commands to draw a different Disney character. Find out who it is by running the program. Do not forget to press RETURN at the end of each line.



```
10 CLS
20 MOVE 460,760
30 DRAW 540,760
40 DRAW 580,660
50 DRAW 480,560
60 DRAW 440,580
70 DRAW 360,620
80 DRAW 360,680
90 DRAW 400,680
100 DRAW 400,700
110 DRAW 460,760
120 MOVE 480,700
130 DRAW 480,740
140 DRAW 520,740
150 DRAW 520,680
160 MOVE 520,760
170 DRAW 520,780
180 DRAW 480,780
190 DRAW 480,760
200 PLOT 69,420,680
210 MOVE 480,560
220 DRAW 400,480
230 DRAW 400,460
240 DRAW 420,440
250 DRAW 500,500
260 DRAW 500,420
270 DRAW 580,340
280 DRAW 600,340
290 DRAW 600,300
300 DRAW 580,300
310 DRAW 560,280
320 DRAW 560,260
330 DRAW 580,240
340 DRAW 620,240
350 DRAW 740,400
360 DRAW 740,500
370 DRAW 660,600
380 MOVE 520,400
390 DRAW 520,320
400 DRAW 500,320
410 DRAW 480,300
420 DRAW 480,200
430 DRAW 500,260
440 DRAW 540,260
450 DRAW 580,340
460 MOVE 560,500
470 DRAW 560,440
480 DRAW 580,380
490 DRAW 620,380
500 DRAW 640,400
510 DRAW 640,540
520 MOVE 600,380
530 DRAW 600,340
540 MOVE 480,500
550 DRAW 560,500
560 PLOT 85,480,560
570 PLOT 85,560,540
580 PLOT 85,600,680
590 PLOT 85,640,540
600 PLOT 85,660,620
```



This program is designed for use on black and white screens. On the BBC computer you should type MODE 4 before using this program.

Game 20

Tron's Video Maze

YOU WILL NEED A DICE AND COLOURED COUNTERS.

This is a simulated video game. Try to help Tron escape from the Maze before you run out of power. You cannot cross the black squares.

POWER

FULL

HALF FULL

WARN -ING LOW

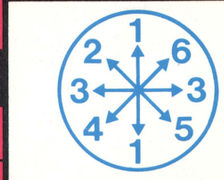
DANGER LOW

EMPTY

ESCAPE

How to play: place one counter on the square marked POWER and another on one of the squares marked START. Throw a dice, and look at the DIRECTION DIAL. The score on the dice gives the direction you can go in. Throw the dice again. This score gives the number of squares you can go in the direction given. Each time the second score is a 6, move the POWER counter down one space. Repeat this until Tron has escaped or until you have run out of power.

ESCAPE



DIRECTION DIAL

Program 5

Peter Pan's Treasure Hunt

This program allows you to play the Peter Pan's Treasure Hunt game on the computer. Do not forget to press RETURN at the end of each line. Do not worry when typing the program into the computer if some of the lines in the program take up more than one line on the screen.

Type MODE 4 before starting.

```
 10 REM "PETERPAN"
 20 CLS
 30 PRINT
 40 PRINT TAB(7) "PETER PAN'S TREASURE
 HUNT"
 50 PRINT
 60 PRINT TAB(7) "Can you find the
 treasure?"
 70 PRINT TAB(7) "Or will you be captured
 by"
 80 PRINT TAB(7) "Indians or eaten by a"
 90 PRINT TAB(7) "crocodile?"
100 PRINT
110 PRINT
120 PRINT TAB(7) "Just answer the
questions"
130 PRINT TAB(7) "about Peter Pan. If you"
140 PRINT TAB(7) "get them wrong—"
150 PRINT TAB(7) "WATCH OUT."
160 PRINT
170 PRINT
180 PRINT
190 PRINT TAB(5) "Press the space bar to
continue"
200 REPEAT UNTIL GET=32
210 CLS
220 PRINT
230 PROCpeter
240 GOTO 1530
250 DEF PROCpeter
260 PRINT "Where does Peter Pan live? A,B
or C?"
270 PRINT
280 PRINT "A Ever-and-Ever Land"
290 PRINT "B Never-Never-land"
300 PRINT "C Forever Land"
310 INPUT A$
320 IF A$="A" THEN PROChook
330 IF A$="B" THEN PROCbell
340 IF A$="C" THEN PROClive
350 ENDPROC
360 DEF PROCbell
370 PRINT
380 PRINT "What is Peter Pan's assistant
called? A,B or C?"
390 PRINT
400 PRINT "A Jingle Bells"
410 PRINT "B Tinkle Tangle"
420 PRINT "C Tinker Bell"
430 INPUT B$
440 IF B$="A" THEN PROChook
450 IF B$="B" THEN PROCname
460 IF B$="C" THEN PROClive
470 ENDPROC
480 DEF PROCname
490 PRINT
500 PRINT "The children's names are: A,B or
C?"
510 PRINT
520 PRINT "A Wendy, John & Michael"
530 PRINT "B Jane, John & Michael"
540 PRINT "C Wendy, James & John"
550 INPUT C$
560 IF C$="A" THEN PROCboys
570 IF C$="B" THEN PROChook
580 IF C$="C" THEN PROClive
590 ENDPROC
600 DEF PROChook
610 PRINT
620 PRINT "Which of Captain Hook's hands
did Peter cut off? LEFT or RIGHT?"
630 INPUT D$
640 IF D$="LEFT" THEN PROCdog ELSE
PROCflag
650 ENDPROC
660 DEF PROClive
670 PRINT
680 PRINT "Do the children live in LONDON
or NEW YORK?"
690 INPUT E$
670 IF E$="LONDON" THEN PROCboys
ELSE PROCcroc
710 ENDPROC
720 DEF PROCflag
730 PRINT
740 PRINT "The pirate's flag is called: A,B
or C?"
750 PRINT
760 PRINT "A The Jolly Roger"
770 PRINT "B The Black Flag"
780 PRINT "C The Stars and Stripes"
790 INPUT F$
800 IF F$="A" THEN PROCdog
810 IF F$="B" THEN PROCgirl
820 PRINT
830 IF F$="C" THEN PRINT "WRONG—
YOU MUST WALK THE PLANK. BYE,
BYE": GOTO 1520
840 ENDPROC
850 DEF PROCdog
860 PRINT
870 PRINT "The children's dog is called: A,B
or C?"
880 PRINT
890 PRINT "A Dana"
900 PRINT "B Nana"
910 PRINT "C Zana"
920 INPUT G$
930 IF G$="A" THEN PROCmum
940 IF G$="B" THEN PROChat
950 IF G$="C" THEN PROCgirl
960 ENDPROC
970 DEF PROCgirl
980 PRINT
990 PRINT "The Indian Chief's daughter is
called: A,B or C?"
1000 PRINT
1010 PRINT "A Tiger Girl"
1020 PRINT "B Tiger Lily"
1030 PRINT "C Lion Flower"
1040 INPUT H$
1050 IF HS="A" THEN PROCboys
1060 IF H$="B" THEN PROChat
1070 PRINT
1080 IF H$="C" THEN PRINT "WRONG—
YOU ARE NOW THE INDIAN'S SLAVE.
BYE, BYE": GOTO 1520
1090 PRINT
1100 ENDPROC
1110 DEF PROChat
1120 PRINT
1130 PRINT "What does John wear on his
head: a TOP HAT or a BOBBLE HAT?"
1140 INPUT J$
1150 IF J$="BOBBLE HAT" THEN PROCboys
1160 PRINT
1170 IF J$="TOP HAT" THEN PRINT
"CONGRATULATIONS—YOU HAVE
FOUND THE TREASURE.": GOTO 1520
1180 ENDPROC
1190 DEF PROCboys
1200 PRINT
1210 PRINT "What are Peter Pan's friends
called: A or B?"
1220 PRINT
1230 PRINT "A The Lost Boys"
1240 PRINT "B The Little Boys"
1250 INPUT K$
1260 IF K$="A" THEN PROChook ELSE
PROCcroc
1270 ENDPROC
1280 DEF PROCcroc
1290 PRINT
1300 PRINT "What does the crocodile have in
his tummy? A,B or C?"
1310 PRINT
1320 PRINT "A A pirate"
1330 PRINT "B An alarm clock"
1340 PRINT "C His dinner"
1350 INPUT L$
1360 IF L$="A" THEN PROChat
1370 IF L$="B" THEN PROCmum
1380 PRINT
1390 IF L$="C" THEN PRINT "YOU ARE
THE CROCODILE'S DINNER. BYE, BYE":
GOTO 1520
1400 ENDPROC
1410 DEF PROCmum
1420 PRINT
1430 PRINT "The children's parents are called
A or B?"
1440 PRINT
1450 PRINT "A Mr & Mrs Daring"
1460 PRINT "B Mr & Mrs Darling"
1470 INPUT M$
1480 IF M$="A" THEN PROChat
1490 PRINT
1500 IF M$="B" THEN PRINT
"CONGRATULATIONS—YOU HAVE
FOUND THE TREASURE.": GOTO 1520
1510 ENDPROC
1520 PRINT "If you want another go, type
RUN"
1530 END
```

Answers

Various Variables: Game 1

1. BAMBI
2. FANTASIA
3. ARISTOCATS

Funny words: FANBAM, BICATS, TOTASIA, FANCATSARISTOBAM

Spelling Strings: Game 2

1. NUMB
2. RAM
3. PUT
4. RING
5. IN ; PUT
6. RUSH ; SHED ; US
7. MIST ; TAKE ; STAKE ; IS
8. 6 small words can be made from WEATHER
   WE = LEFT$(1,2)
   EAT = MID$(2,4)
   AT = MID$(2,3)
   THE = MID$(4,6)
   HE = MID$(5,6)
   HER = RIGHT$(5,7)

Print Posers: Game 3

PRINT HELLO	Mistake
PRINT "HELLO"	HELLO
PRINT 10/5	2
PRINT 2*2*2	8
PRINT 10*10*10/10	100
PRINT 2+2	4

The simple program would write GOODBYE.

Computer Comparison: Game 4

YES	Baloo is fatter than Mowgli.
GOOD	Piglet is smaller than Pooh.
YES	Mickey has more apples than Donald.
YES	Bambi has more spots than the dalmatian.
TRUE	Mickey and Pluto have the same size tails.

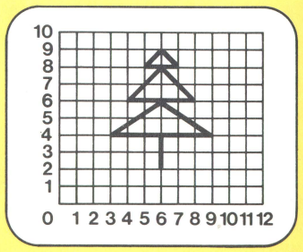
Plotting Pictures: Game 8

1. A 3,3
   B 3,7
   C 6,9
   D 9,7
   E 9,3
   F 6,1

2.
```
10 PLOT  3,3
20 DRAW 6,9
30 DRAW 9,3
40 DRAW 3,3
50 PLOT  3,7
60 DRAW 9,7
70 DRAW 6,1
80 DRAW 3,7
```

3.
```
10 PLOT  2,4
20 DRAW 4,4
30 DRAW 4,5
40 DRAW 5,5
50 DRAW 5,6
60 DRAW 6,6
70 DRAW 6,5
80 DRAW 8,5
90 DRAW 8,4
100 DRAW 11,4
110 DRAW 11,2
120 DRAW 3,2
130 DRAW 2,4
```

4.



Answers

Bug Blaster: Game 10

1. Line 20 — GOOFY is not a numeric variable.
2. Line 20 — OH should be in quotation marks.
3. Line 100 — TRON IS GREAT should be in quotation marks.
4. Line 70 — THEN is missing.
5. Lines 10 and 20 form a loop which will go on forever.
6. Line 35 — no instruction after UNTIL, so the program will go on forever.
7. Lines 100 and 200 are in the wrong order. You have to PLOT before you can DRAW.
8. Line 30 — should be in capital letters.

Traffic Light Test: Game 11

Box	Instruction	Box	Instruction
1	A	5	C
2	H	6	B
3	D	7	G
4	F	8	E

Bar Code Breaker: Game 12

1. 
2. 

3. Socks
4. Shoes

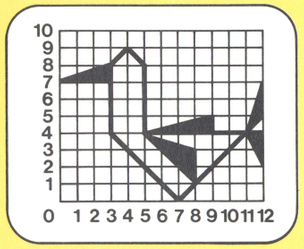
Great Graphics: Game 13

1. 4,9 ; 8,9 ; 6,5

2.
```
10 PLOT  69,6,5
20 DRAW 4,9
30 DRAW 8,9
40 PLOT  85,6,5
```

3.
```
10 PLOT  69,6,5
20 DRAW 4,9
30 DRAW 8,9
40 PLOT  85,6,5
50 DRAW 10,7
60 DRAW 10,3
70 PLOT  85,6,5
80 DRAW 8,1
90 DRAW 4,1
100 PLOT  85,6,5
110 DRAW 2,3
120 DRAW 2,7
130 PLOT  85,6,5
```

4.



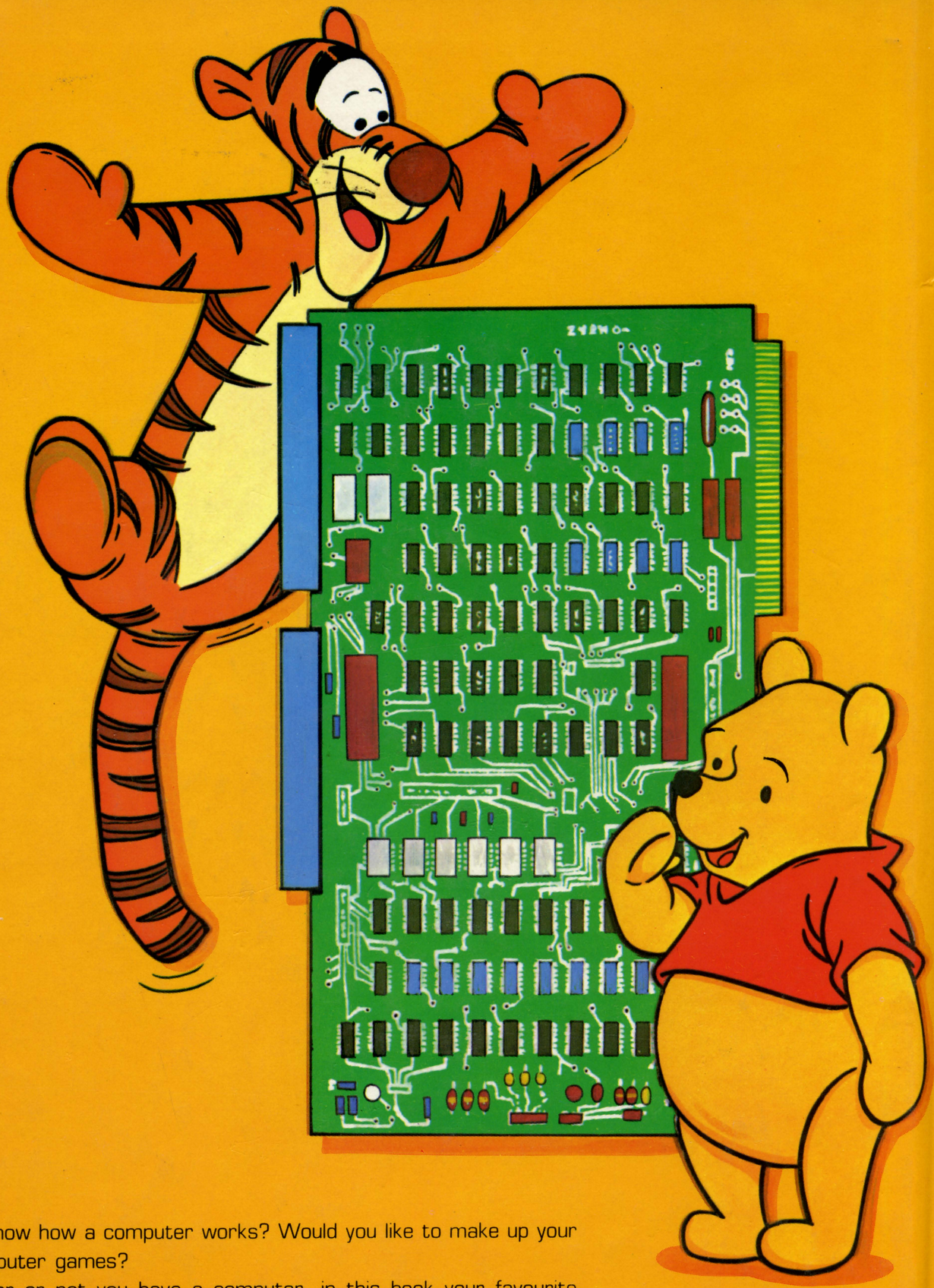
Queue Quiz: Game 14

Goofy will need 4 assistants to make sure that there is never a queue of more than 3 customers.

Robin's Robot: Game 15

The 10 instructions Robin needs to make tea are:

1. Fill the kettle with water
2. Plug the kettle in
3. Switch the kettle on
4. Wait until the kettle boils
5. Switch the kettle off
6. Put tea in the teapot
7. Pour water into the teapot
8. Wait until the tea has brewed
9. Put milk in the cups
10. Pour tea in the cups



Do you know how a computer works? Would you like to make up your own computer games?

Whether or not you have a computer, in this book your favourite Disney characters will show you how to have hours of fun with their adventure games, puzzles and programs—they will even show you how to make a computer tell a joke!

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